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Full Length Research Paper

Estimating water needs of maize (*Zea mays* L.) using the dual crop coefficient method in the arid region of northwestern China

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Abstract

Understanding crop water needs is essential for irrigation scheduling and water saving measures in an arid region because of its limited water supply. This study was performed using the dual crop coefficient method to predict seasonal changes in evapotranspiration (ET_c) for maize fields in northwestern China in 2004. The reference crop evapotranspiration ET₀, an important parameter in simulating the actual crop evapotranspiration (ET_c), was estimated using FAO Penman–Monteith equation. The values suggested by FAO-56 were used for the basal crop coefficients (K_{cb}) after adjustment for the specific climatic condition in the study area. The soil evaporation coefficients (K_e) were determined for the climate, the soil, the maize growing stages, and the irrigation method. Some missing climatic parameters were calculated. The results showed that the ET_c values were very low (average value of 1.09 mm day⁻¹) except during irrigation events in the initial stage of crop growth. The ET_c value increased during the crop development stage (average value of 3.67 mm day⁻¹) and reached its peak during the mid-season stage (average value of 5.49 mm day⁻¹), then the ET_c value declined rapidly during the last crop growth stage (average value of 3.33 mm day⁻¹). In general, the evapotranspiration (ET_c) ranged from 0.54 to 7.69 mm day⁻¹ and the total actual ET_c was 611.5 mm at the experimental site in the growing season of 2004.

Key words: Evapotranspiration; dual crop coefficient; maize (*Zea mays* L.); FAO-Penman

monteith equation; crop water requirement.



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